

SPERGENASPIS: A NEW CARBONIFEROUS TRILOBITE
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ABSTRACT

A new trilobite genus, *Spergenaspis*, is erected based upon three Mississippian trilobite species from the midcontinent of the United States. Two of the species, *S. easleyi*, new species, from the Chouteau Formation of Missouri, and *S. salemi*, new species, from the Salem Limestone of Indiana are previously undescribed. The third species, *S. mauvaisensis* (Hessler) is reassigned from the genus *Richterella* and is known from the Upper Osagean or Lower Meramecian of Illinois.

Known occurrences of *Spergenaspis* suggest that species of this genus inhabited similar environmental settings. Lithologies from which *Spergenaspis* is recovered vary from sandy lime packstone to oolitic to crinoidal lime grainstone. Interpreted depositional environments for these lithologies include transgressive shallow subtidal and sand shoal.

INTRODUCTION

Hessler (1965) erected the Mississippian trilobite genus *Richterella* and based it on three species known from the midcontinent region of North America. One of these species, *Richterella mauvaisensis* Hessler, differs from the diagnosis of the genus in that it exhibits considerably less vaulting with a bell-shaped glabella, possesses a broad concave-up frontal area, lacks a straight section in the facial sutures from ϵ to ζ , and possesses a distinct subdivision of the pygidial ribs into anterior and posterior bands. Recent recognition of two previously undescribed Mississippian trilobite species bearing characters similar to *R. mauvaisensis* Hessler justifies their being grouped together as a distinct genus, *Spergenaspis*. These features, which characterize *R. mauvaisensis* Hessler, can best be grouped under the subfamily Linguaphillipsiinae as outlined by Hahn and Hahn (1972).

Members of the trilobite subfamily Linguaphillipsiinae are not known from the Lower Carboniferous of North America even though they are relatively widespread geographically and stratigraphically in Europe and Asia (Hahn and Hahn, 1973, 1982; Engel and Morris, 1975; Brauckmann, 1978; Kobayashi and Hamada, 1980). Assignment of the new genus *Spergenaspis* to the subfamily Linguaphillipsiinae marks the first documentation of this subfamily in North America. Moreover, recovery of a species of *Spergenaspis* from the base of the Chouteau Formation (Middle Kinderhookian) indicates that immigration into North America was concomitant with the Kaskaskia onlap (Brezinski, 1986a). That these representatives have previously gone unnoticed may be the result of either their scarcity or their paleoecology. The latter of these two possibilities will be discussed below.

Terminology utilized in this paper is similar to that proposed by Harrington (1959) and Richter and Richter (1949). Specimens illustrated in this study are deposited at The Carnegie Museum of Natural History (CMNH). Type specimens

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of *Spergenaspis mauvaisensis* (Hessler) examined for this study are repositied with the Illinois Geological Survey.

STRATIGRAPHIC DISTRIBUTION

The known species of *Spergenaspis* are found in Middle Kinderhookian through Lower Meramecian strata in the midcontinent region of the United States. The oldest species, *Spergenaspis easleyi*, new species, was recovered from the basal strata of the Chouteau Formation (Middle Kinderhookian) of central Missouri (locality 1 of Brezinski, 1986a). Canis (1968) found that these strata are assignable to the *Siphonodella quadruplicata*-*S. crenulata* conodont zone, which is roughly equivalent to the Cu II_a ammonoid zone of Tournaisian rocks of Europe. The next youngest species, *Spergenaspis mauvaisensis* (Hessler), was found in Upper Osagean or Lower Meramecian strata of Scott County, Illinois (see Hessler, 1965, for locality information). The youngest species, *Spergenaspis salemi*, new species, was collected from several localities in the Salem Limestone (Meramecian) of southwestern Indiana. Additionally, two pygidia, from the Keokuk Limestone (Osagean) of St. Genevieve County, Missouri, tentatively assigned to the genus *Waribole* by Brezinski (1986b), are here reassigned to the new genus.

PALEOECOLOGY

Although *Spergenaspis* exhibits a considerable stratigraphic range, its restricted geographic distribution parallels many other trilobite genera known from this time interval. As a result, Kobayashi and Hamada (1980) were able to discern several distinct trilobite realms composed of numerous provinces. One of the most distinct of these faunal provinces is the midcontinent area of North America, where no less than 10 of 18 known genera are endemic. Studies by Brezinski (1986a, 1986b) indicate that this endemism is the result of trilobite genera becoming narrowly adapted to specific environmental conditions, thus precluding emigration to other areas which might not provide the precise conditions necessary for habitation. This niche-specialization is indicative of stenotopic species (Valentine, 1972).

All presently known occurrences of *Spergenaspis* appear to be found in rocks that represent similar environmental settings. *S. easleyi* from the Chouteau was recovered from a sandy wackestone lithology which is interpreted as having been deposited in a shallow subtidal transgressive environment (King, 1980; Brezinski, 1986a). Coarse tuberculate ornament on several of the associated trilobite species may indicate agitated conditions (McNamara and Fordham, 1981). The lithology in which *S. mauvaisensis* (Hessler) occurs, is a coarse-grained crinoidal packstone with lenses of crinoidal grainstone, also suggestive of high-energy conditions of deposition. *S. salemi* was recovered from a poorly cemented, coarse-grained, oolitic, gastropod grainstone which Donahue (1967) interpreted as having been formed in a sand-bar shoal environment. The two pygidia of the undetermined species of *Spergenaspis* from the Keokuk Limestone of Missouri were collected from well-sorted crinoidal lime grainstones associated with oolitic grainstone strata. These occurrences of *Spergenaspis* indicate that members of this genus probably inhabited high-energy environmental settings such as shoal sands or nearshore tidal sands, although some transport is probable. The low relief and lack of surface ornamentation shown by members of this genus may be the result, in a large part, of their ecological affinities. Similar features are exhibited by trilobite species from the Gilmore City Limestone of Iowa (Kinderhookian-Osagean). The Gilmore City Limestone, like the examples discussed above, consists

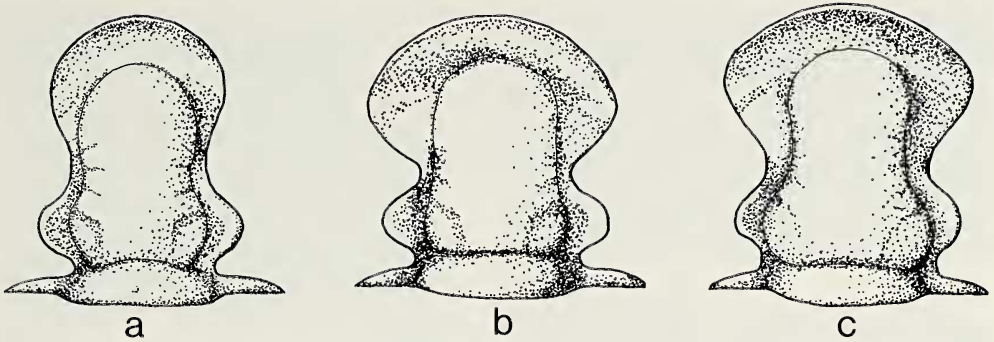


Fig. 1. — Comparative reconstructions of cranidia of a, *Spergenaspis easleyi* new genus and new species; b, *Spergenaspis salemi* new genus and new species; c, *Spergenaspis mauvaisensis* (Hessler), all approximately $\times 3.5$.

of an oolitic grainstone of shoal-water origin. The lack of surface features, and low profile to the exoskeletons of these species are interpreted as adaptations to reduce friction created by passing currents, thus making them more hydrodynamically stable.

SYSTEMATIC PALEONTOLOGY

Family Proetidae Salter, 1864

Subfamily Linguaphillipsiinae Hahn and Hahn, 1972

Genus *Spergenaspis*, new genus

Type species. — *Spergenaspis salemi*, new genus and new species.

Other species assigned. — *Spergenaspis easleyi*, new genus and new species, *Spergenaspis mauvaisensis* (Hessler, 1965).

Diagnosis. — Smooth isopygous genus with cranidium possessing a broad concave-up fixigenae, bell-shaped glabella, broader behind γ than in front of it, and large palpebral lobes, located at the base of the glabella. Pygidium smooth with wide border flange; ribs divided by pleural furrow into bands of equal width.

Comparisons. — Genera similar to *Spergenaspis* and with which it might be confused are *Waribole* Richter and Richter, 1926, *Gitarra* Gandl, 1968, *Linguaphillipsia* Stubblefield, 1948, *Pseudowaribole* Hahn and Hahn, 1967, and *Griffithidella* Hessler, 1965. *Waribole* can be distinguished from *Spergenaspis* in that the former possesses a conical glabella lacking a constriction at γ , more anteriorly located eyes, and narrower palpebral lobes. A somewhat similar genus *Linguaphillipsia* can be differentiated from *Spergenaspis* by the greater anterior elongation of the glabella, more anterior location of the palpebral lobes, by the much smaller width to length ratio of the pygidium, by the commonly well-developed surface sculpture, and structure of the pygidial ribs on the former. The genus *Gitarra* differs from *Spergenaspis* in that the former has a more strongly constricted, guitar-shaped glabella, very large eyes, and a shorter, broader pygidium with well-defined segmentation and ribs that extend to the margin. *Spergenaspis* differs from *Pseudowaribole* (*Pseudowaribole*) in that *Spergenaspis* is isopygous, lacks a well-defined border furrow to the cephalon, has more posteriorly located (with respect to the glabella), larger, palpebral lobes, stronger constriction of the glabella at γ , and a longer and broader pygidium possessing a well-defined border. *Spergenaspis* differs from *Pseudowaribole* (*Geigibole*) in that the latter is not

isopygous, exhibits a very short and broad, subtriangular pygidium, a broad cranidium, much larger, more anteriorly located palpebral lobes and eyes, and a narrower anterior fixigenae. Pygidia of *Griffithidella depressus* var. *depressus* (Girty) (see Hessler, 1965, pl. 38, figs. 1-11, 14) are quite similar in many characteristics to those of *Spergenaspis*. Inasmuch as no cranidia of *G. depressus* var. *depressus* are known, it is questionable whether these pygidia are truly assignable to the genus *Griffithidella*.

Spergenaspis salemi, new genus and new species

Fig. 2A-I, M

Holotype.—An incomplete cephalon from the Salem Limestone at a railroad cut near Spergen Hill, Washington County, Indiana. NW $\frac{1}{4}$, SE $\frac{1}{4}$, sec. 24, T2N, R4E, Salem Quadrangle. Collected by R. T. Garney. CMNH 34433.

Paratypes.—An external mold of a cranidium and two pygidia from the Cleveland Quarry, Monroe County, Indiana. SE $\frac{1}{2}$, NW $\frac{1}{4}$, sec. 20, T7N, R4E, Clear Creek Quadrangle. Collected by H. B. Rollins. 1 cranidium and 6 pygidia from the Spergen Hill railroad cut collected by R. Garney. CMNH 34434-34437.

Diagnosis.—Species of *Spergenaspis* with a subcylindrical glabella, slightly wider at the base than at γ , palpebral lobes very large, anterior facial sutures recurved from γ to β . Pygidium semicircular in outline.

Description.—Cephalon semicircular in outline, very low in relief and vaulting. Glabella approximately 1.50 times as long as the maximum width, subcylindrical and rounded anteriorly, widest between the eyes, tapering slightly to the 3 p glabellar furrow, then nearly parallel sided to faintly diverging anteriorly. 1 p furrow broad, shallow, and nearly obsolete, all other glabellar furrows very faint to obsolete on the dorsal exoskeleton. Occipital lobe of nearly even width only slightly wider at axis. Occipital furrow narrow and arcuate, becoming shallower near the axial furrow. Palpebral lobes large and crescentic in outline, located very near the base, with the 1 p furrow intersecting the dorsal furrow anterior to the palpebral midline (longitudinal). Facial sutures strongly divergent from γ to β , broadly rounded through β . Preglabellar field gently concave-up (sagittal) to flat (exsagittal). Eyes narrow and near vertical, reniform. Border becomes more concave-up anteriorly, extends posteriorly onto a short sharp genal spine which is 0.33 times the total librigenae length.

Pygidium low in relief and semicircular in outline, 1.48 to 1.61 times as wide as long. Axis 0.37 times as wide as maximum pygidial width, composed of 12 to 13 smooth rings. Ring furrows become increasingly obscure and shallow near the posterior terminus. Pleural fields mildly convex, composed of 6 to 9 ribs, the posterior two of which are difficult to discern on the dorsal surface, but are evident on the internal surface. Each rib exhibits an anterior and posterior moiety of nearly equal width. Pleural furrows terminate at the border. Border from 0.20 to 0.28 the total pygidial length (sagittal), broader near the posterior terminus and becoming narrower anteriorly.

Discussion.—Similarity in morphology suggests that *Spergenaspis salemi* is closely related to *Spergenaspis mauvaisensis* (Hessler). This is especially evident in the overall plan to the cephalon and pygidium, but differs in several respects. Firstly, *S. mauvaisensis* (Hessler) has a straight diverging section on the anterior facial sutures from γ to β , more acutely rounded facial suture at β , a bell-shaped glabella which is relatively wider between the eyes and more constricted at the base and γ . The pygidium of *S. mauvaisensis* is more parabolic in outline and possesses a smaller width to length ratio. *Griffithidella depressus* var. *depressus* (Girty) exhibits similar numbers of rings and ribs as *S. salemi*. However, it can be differentiated from the latter by the slightly shorter, broader pygidial outline and the poorly defined border.

Age and distribution.—Known only from the Salem Limestone, Meramecian, of southern Indiana.

Etymology.—This species is named for the Salem Limestone from which the type material was collected.

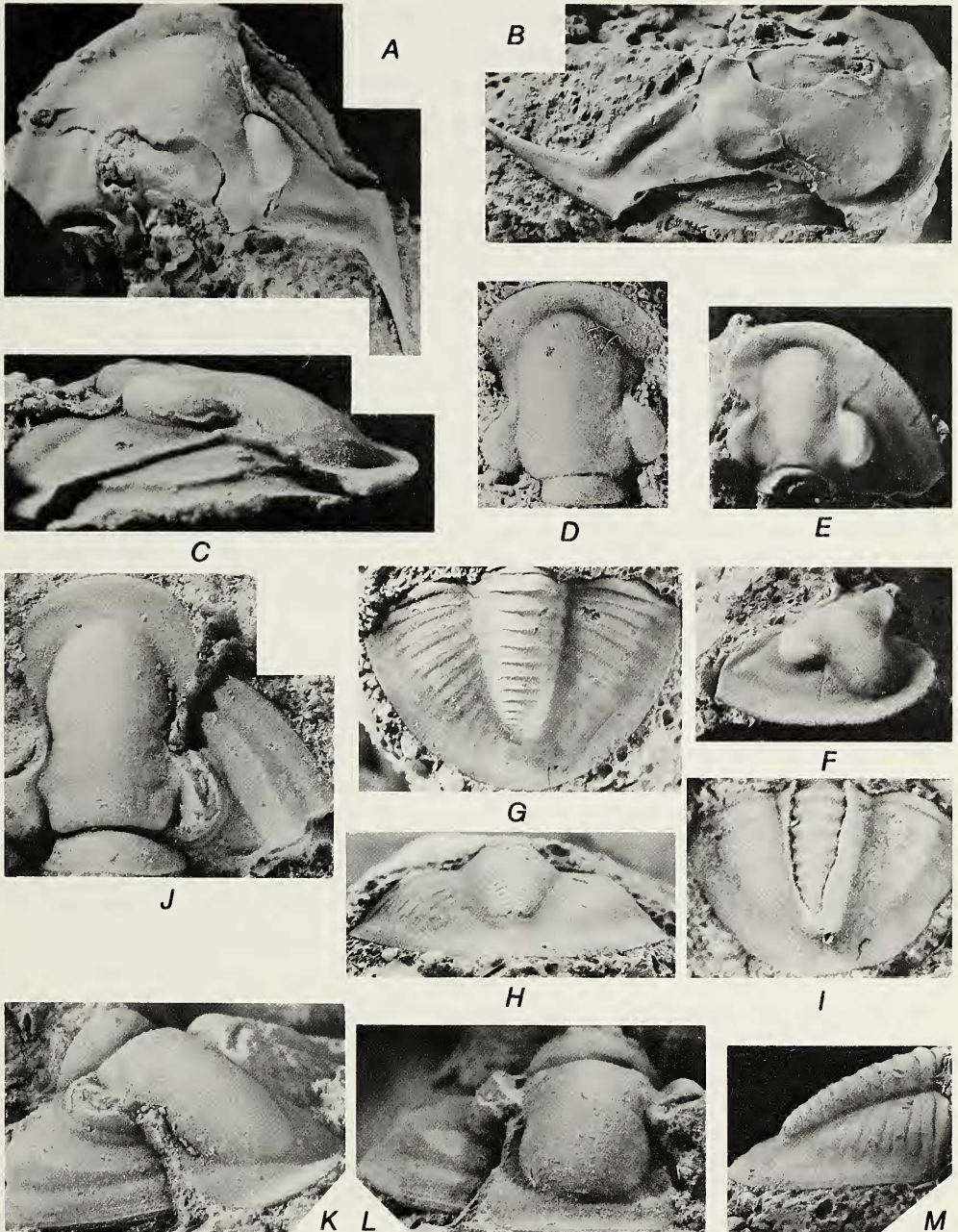


Fig. 2.—A–I, *M*, *Spergenaspis salemi* new genus and new species. A–C, dorsal, oblique, and lateral views of partially exfoliated holotype cephalon, CMNH 34433, $\times 4$; D, external mold of paratype cranidium, CMNH 34434, $\times 3$; E, F, dorsal and oblique views of unexfoliated paratype cephalon, CMNH 34435, $\times 2.5$; G, H, M, dorsal, posterior, and lateral views of paratype pygidium, CMNH 34436, $\times 3.5$; I, partially exfoliated paratype pygidium, CMNH 34437, $\times 3$. J–L, *Spergenaspis easleyi* new genus and new species, dorsal, oblique, and anterior views of unexfoliated holotype cephalon, CMNH 34438, $\times 5$.

Spergenaspis easleyi, new genus and new species

Fig. 2J-L

Richterella? sp. BREZINSKI, J. Paleont. 1986, 60:873, table 1, fig. 5.

Holotype.—A partial cephalon from the basal Chouteau Formation 1.75 km northwest of Easley, Missouri along the bluffs of the Missouri River, collected by the author, 1980; CMNH 34438.

Other material.—Only the holotype is known.

Diagnosis.—Species of *Spergenaspis* with a narrow (transverse) cranidium, glabella narrower at γ and the base than between the eyes. Frontal glabellar lobe semicircular in outline, anterior facial sutures only slightly divergent, rounded from γ to β , γ narrower than ϵ .

Description.—Profile of cephalon low. Glabella smooth and elongate, 1.76 times as long as maximum width, constricted at γ , frontal glabellar lobe broadly rounded. Glabellar furrows, except 1 p, very faint, nearly obsolete, 1 p furrow shallow and faint, intersects dorsal furrow at the anterior half of the palpebrae, extends posteriorly at an oblique angle to the axis, then forms an obtuse angle and intersects the occipital furrow at nearly a right angle. Frontal glabellar lobe descends gently into a concave preglabellar field which is upturned to the margin (sagittal) and becomes flattened to downsloping (exsagittal). Palpebral lobes relatively large and crescentic, located at the base of the glabella. Occipital lobe broad and smooth, widest at the axis, very gently downsloping into a narrow, sharp occipital furrow with an arcuate trace. Eyes not well preserved on holotype, but appear to be vertical and reniform. Librigenae gently downsloping from the eyes becoming more steeply inclined onto the border then descending less steeply to the margin. Facial sutures moderately divergent from γ to β , broadly rounded from γ to α .

Discussion.—Although it is generally inadvisable to propose new species on the basis of a single specimen, *S. easleyi* is so markedly differentiable from either *S. salemi* or *S. mauvaisensis* the erection of a species in this case seems warranted. The narrow, anteriorly elongate glabella, which is constricted at γ , appears to be a synapomorphic character connecting this genus with ancestral Linguaphillipsiinae such as *Pseudowaribole*.

Age and distribution.—Known only from the type locality in the basal Chouteau Formation (Middle Kinderhookian) of Boone County, Missouri.

Etymology.—Named for the town of Easley in Boone County, Missouri near where the holotype was collected.

CONCLUSIONS

The subgenus *Spergenaspis* arose during or immigrated into North America concurrently with the Kaskaskia transgression. Representatives have probably previously gone unnoticed primarily because: 1) they are not common where they do occur, 2) they are highly restrictive with respect to the type of environment in which they are found. This type of habitat restriction may also be the main reason for the strong endemism exhibited by this genus, inasmuch as members may have been unable to emigrate owing to unfavorable conditions outside their local habitat.

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